

CLAIMS

What is claimed is:

1. A method for controlling the flow of water in a material to maintain a medium in thermal contact with the material approximately at a predetermined temperature, the method comprising the steps of:

providing a layer of the material in thermal contact with the medium, the material containing particles of a gel embedded therein, the gel having a gel volume phase transition critical temperature (VPTCT) at about the predetermined temperature; and

providing a fluid for flow through the material to regulate the temperature of the medium,

wherein the gel particles in the material absorb the fluid and expand to restrict flow when the temperature of the fluid is below the gel volume phase transition critical temperature and contract and expel the fluid to allow flow when the temperature of the fluid is above the gel volume phase transition critical temperature.

2. The method of claim 1, wherein the material is an open cell foam material.

3. The method of claim 1, wherein the layer of the material includes gel particles in an amount approximately 5% to 80% by weight of total dry weight of the material.

4. The method of claim 1, wherein the step of providing a layer of the material includes providing a wet suit to a diver.
5. The method of claim 4, wherein the gel is a hydrogel powder having a VPTCT in the range of about 18°C to about 25°C.
6. The method of claim 4, wherein the layer of material includes gel particles in an amount approximately 5% to 80% by weight of total dry weight of the foam layer.
7. The method of claim 4, wherein the gel particles are formed from a poly(N-isopropylacrylamide) gel.
8. The method of claim 4, wherein the gel contains a hydrophobic monomer.
9. A wet suit for controlling the flow of water to maintain a desired skin surface temperature of a wearer, the wet suit comprising:
 - an outer layer; and
 - an inner layer comprising gel particles embedded in a matrix, the gel having a gel volume phase transition critical temperature (VPTCT) at about the desired skin surface temperature,wherein the gel particles in the matrix absorb the fluid and expand to restrict flow when the temperature of the fluid is below the gel volume phase transition critical temperature and contract and expel the fluid to allow flow

when the temperature of the fluid is above the gel volume phase transition critical temperature.

10. The wet suit of claim 9, wherein the matrix comprises a foam layer.

11. The wet suit of claim 9, wherein the outer layer comprises neoprene.

12. The wet suit of claim 9, further comprising a second inner layer inside of the inner layer, the second inner layer having a slick surface for contact with the wearer.

13. The wet suit of claim 9, further comprising a second outer layer outside of the outer layer.

14. The wet suit of claim 9, wherein the gel is a hydrogel having a VPTCT in the range of about 18°C to about 25°C.

15. The wet suit of claim 9, wherein the inner layer includes gel particles in an amount approximately 5% to 80% by weight of total dry weight of the matrix.

16. The wet suit of claim 9, wherein the gel particles comprise poly(N-isopropylacrylamide).

17. The wet suit of claim 16, wherein the gel particles contain a hydrophobic monomer.

18. The wet suit of claim 17, wherein the hydrophobic monomer is N-tert-butylacrylamide.

19. The wet suit of claim 9, wherein the VPTCT is about 18°C.

20. An article comprising:

an outer layer; and

an inner layer comprising gel particles embedded in a matrix, the gel having a gel volume phase transition critical temperature (VPTCT) at about the desired skin surface temperature,

wherein the gel particles in the matrix absorb the fluid and expand when the temperature of the fluid is below the gel volume phase transition critical temperature and contract and expel the fluid when the temperature of the fluid is above the gel volume phase transition critical temperature.

21. The article of claim 20 wherein the matrix is a foam matrix.

22. The article of claim 20 in the form of a web of material.

23. The article of claim 20 in the form of a tubular member.